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Alfred E. Mann School of Pharmacy and Pharmaceutical Sciences

Value Defects in Spine Surgery: How to Reduce Wasteful Care and Improve Value

William V. Padula (1), Hanke Zheng (1), Jiahe Chen (1), Gabriel A. Smith (2), Zachary Gordon (2), Peter J. Pronovost (3)

(1) University of Southern California, Los Angeles, CA, USA
(2) University Hospitals Spine Institute, Cleveland, OH, USA
(3) University Hospitals, Cleveland, OH, USA

USC Schaeffer
Leonard D. Schaeffer Center for Health Policy & Economics

BACKGROUND

- **Procedures to correct spine disorders are costly but becoming more common in the US**
  - Include cervical simple fusion (CSF), lumbar simple fusion (LSF) and lumbar discectomy and decompression (LDD)
  - At least 512,000 annual cases cost the US health system **over $20 billion per year**
- But some patients who underwent these surgeries may find themselves not feeling different than before, or even worse off
- Literature has pointed out that non-operative care could be a less costly alternative treatment
- These spine surgeries are therefore potentially low-value or no-value care, resulting in **defects in value**

OBJECTIVES

- **1) To estimate the cost burden of value defects in spine surgery and predict the savings from eliminating these defects**
- **2) To present an approach to eliminate defects in spine surgery**

METHODS

- **We systematically reviewed literature of spine surgery-related care that provided low value or no value**
  - i.e., little or no clinical benefit while may be harmful to the patient with increased costs
- Value defects framework is utilized to examine the cost-effectiveness of aspects related to decreased value;
- And to estimate the opportunity costs to the US healthcare system that could have been saved by eliminating these defects using data from published literature and publicly available reports

RESULTS

- The annual value defects related to low-value or no-value spine surgery are estimated to be **more than $2 billion (Table 1)**
- No-value spine surgeries may be **inappropriate** at all, or result in **preventable readmissions, reoperations and hospital-acquired complications (Figure 1)**
  - Estimated opportunity costs related to no-value aspects are **$1.7 billion**
- Low-value spine surgeries may involve **avoidable post-acute care facility uses** or be conducted at **healthcare facilities with low operation volumes (Figure 1)**
  - Estimated opportunity costs related to low-value aspects are **$0.6 billion**
- **High volume and specialized healthcare facilities, such as spine surgery Centers of Excellence (COE)** designated by The Joint Commission may be one of the keys to reduce value defects
  - COEs can reduce the costs of care for spine surgery **(Table 2)** and reduce rates of several major complications **(Table 3)**

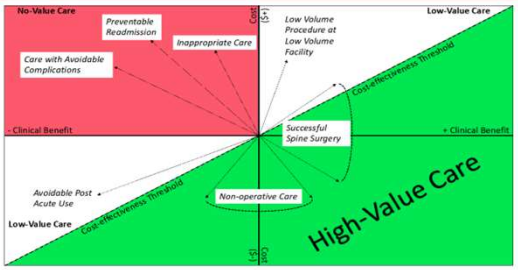

Figure 1. Cost-effectiveness plane of defects in value of spine surgery (relative to the value-added of successful surgery and non-operative care)

Defect in Value	Description	Estimated Cost
Low-Volume Procedure at Low-volume Site of Care	Medical cost savings during the first 90 days of care after index procedure at Centers of Excellence in spine surgery compared to low-volume centers	$360.4 million
Avoidable Post-acute Use	Differential complications that occur in sub-acute rehabilitation and skilled nursing facilities compared to home health	$208.1 million
Avoidable Complications and Readmission	Patients that undergo readmission and additional procedures within 90 days of index procedure	$24.90 million
Inappropriate Surgeries	Inappropriate spinal surgeries that are considered unnecessary	$1.724 billion
Total Cost	N/A	$2.317 billion

Table 1. Total cost of defects in value related to spine surgery

Type of Spine Surgery	Annual Volume (N)	Facility COE Designation	Medical Cost Per Patient (90-day)	COE Savings Per Patient
CSF	13,020	COE	$36,501	$361
		Non-COE	$37,004	(Reference)
LSF	12,095	COE	$62,610	$750
		Non-COE	$63,656	(Reference)
LDD	12,849	COE	$20,250	$401
		Non-COE	$20,809	(Reference)
Total Potential Savings	$360.4 million			

Table 2. Potential cost difference of spine surgery in COEs compared to non-COEs during the first 90 days of care after index procedure

Type of Spine Surgery	Facility COE Designation	Complications (%)							
		AMI	Pneumonia	Sepsis	VTE	Mortality	Wound	Reoperation	Readmission
CSF	COE	0.05	0.26	0.14	0.16	0.04	0.25	0.53	2.32
	Non-COE	0.04	0.25	0.14	0.12	0.02	0.31	0.62	2.25
LSF	COE	0.11	0.55	0.51	0.49	0.04	1.54	1.17	5.23
	Non-COE	0.12	0.68	0.53	0.35	0.06	1.36	1.41	5.13
LDD	COE	0.07	0.18	0.13	0.15	0.01	0.96	1.91	3.55
	Non-COE	0.05	0.20	0.17	0.19	0.04	0.93	2.04	3.86

Table 3. Avoidable complication rates in COEs and non-COEs for spinal surgery

CONCLUSIONS

- **Establishing COEs may be a key to eliminating value defects related to spine surgery outcomes**
  - The amount of potential saving of spine surgery COEs for the US healthcare system is estimated to be **$360 million**
- **COEs can reduce wasteful medical costs by:**
  - Applying appropriateness criteria for all patients to ensure that patients receive the correct degree of intervention for their condition
  - Having the correct measures in place to prevent and detect risk for hospital-acquired complications
  - Providing the right complementary services to execute efficient follow-up that minimizes the likelihood of prolonged complications

REFERENCES

- Dietz DW, Padula WV, Zheng H, Pronovost PJ. Costs of Defects in Surgical Care: A Call to Eliminate Defects in Value. NEJM Catalyst 2021;2(6).
- Martin RC, Petitt JC, Pan X, et al. Spine centers of excellence: a systematic review and single-institution description of a spine center of excellence. J Spine Surg 2022;8(1):44-53.
- Mehrotra A, Sloss EM, Hussey PS, Adams JL, Lovejoy S, SooHoo NF. Evaluation of a center of excellence program for spine surgery. Med Care 2013;51(8):748-57.
- Padula WV, Sculpher MJ. Ideas About Resourcing Health Care in the United States: Can Economic Evaluation Achieve Meaningful Use? Ann Intern Med 2021;174(1):80-85.
- Pronovost PJ, Urwin JW, Beck E, et al. Making a Dent in the Trillion-Dollar Problem: Toward Zero Defects. NEJM Catalyst 2021;2(1).
- Weinstein JN, Lurie JD, Olson PR, Bronner KK, Fisher ES. United States' trends and regional variations in lumbar spine surgery: 1992-2003. Spine 2006;31(23):2707-14.
- Weinstein JN, Tosteson AN, Tosteson TD, et al. The SPORT value compass: do the extra costs of undergoing spine surgery produce better health benefits? Med Care 2014;52(12):1055-63.

CONTACT

Jiahe Chen, MS
jiaheche@usc.edu